

Application No.: 10/660,608Docket No.: 2336-202**AMENDMENTS TO THE CLAIMS:**

This listing of claims will replace all prior versions, and listings, of claims in the application:

**Listing of Claims:**

1. (canceled)

2. (currently amended) A signal processor for use in an electronic compass for processing signals from a geomagnetic compass sensor detecting sine or cosine wave signals induced by a drive signal according to an azimuth angle, said signal processor comprising:

an analog signal processor for amplifying the signals from the geomagnetic compass sensor, canceling an offset voltage generated during an amplification process in response to an offset control signal, and controlling an amplitude of a signal in which the offset voltage is cancelled out in response to a gain control signal;

an analog/digital (AD) converter for converting analog signals from the analog signal processor into a digital signal; and

a digital signal processor for measuring a maximum value and a minimum value associated with the digital signal from the AD converter, determining the offset voltage and the amplitude on the basis of the maximum and minimum values, and outputting, to the analog signal processor, the offset control signal to be used for canceling the determined offset voltage and the gain control signal to be used for controlling the determined amplitude so that the amplitude lies within an allowable input range for the AD converter;

The signal processor as set forth in claim 1, wherein the analog signal processor comprises:  
a chopper for detecting the signals from the geomagnetic compass sensor;  
an input amplifier for amplifying the detected signals outputted from the chopper on

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the basis of a preset gain;

a low pass filter for carrying out a preset low pass filtering operation for a signal outputted output from the input amplifier;

an offset controller for generating a cancelling voltage for canceling [[an]] the offset voltage in response to the offset control signal and providing the generated cancelling voltage to input terminals of the input amplifier; and

an automatic gain control (AGC) amplifier for setting an amplification gain in response to the gain control signal and amplifying a signal from the low pass filter in response to the set amplification gain.

3. **(currently amended)** The signal processor as set forth in claim [[1]] 2, wherein the digital signal processor:

measures the maximum value and the minimum value associated with the digital signal from the AD converter;

decides determines the offset voltage on the basis of an average value of the maximum value and the minimum value;

decides determines the amplitude on the basis of a difference value between the maximum value and the minimum value; and

outputs, to the analog signal processor, the offset control signal to be used for canceling the decided determined offset voltage and the gain control signal to be used for controlling the decided determined amplitude [[such]] so that [[it]] the amplitude lies within the allowable input range for the AD converter.

4. **(currently amended)** The signal processor as set forth in claim 2, wherein the offset controller is configured to have so that an internal resistance value that varies with the offset control signal and wherein the cancelling voltage for canceling the offset is generated according to the variable internal resistance value.

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5. (currently amended) The signal processor as set forth in claim 2, wherein the offset controller comprises:

an operational amplifier having an inversion input terminal for receiving a base voltage, [[an]] a non-inversion input terminal coupled to [[a]] ground through a resistor, and an output terminal coupled to a supply voltage;

a resistor chain having a plurality of resistors coupled in series between the output terminal and the non-inversion terminal of the operational amplifier ~~in series~~; and

a switching unit having a plurality of switches ~~that are each of which is~~ coupled in parallel to [[each]] one of the resistors of the resistor chain ~~in parallel~~, respectively, and ~~are~~ and ~~is~~ turned on/off in response to the offset control signal.

6. (currently amended) The signal processor as set forth in claim 2, wherein the AGC amplifier amplifies the input signals signal from the low pass filter on the basis of [[a]] the amplification gain defined decided upon by [[its]] a specific resistance value of said AGC amplifier and a variable resistance value varying with the gain control signal.

7. (currently amended) The signal processor as set forth in claim 2, wherein the AGC amplifier comprises:

an operational amplifier having a non-inversion input terminal for receiving [[a]] the signal from the low pass filter, an inversion input terminal for receiving a reference voltage from a reference voltage terminal and an output terminal;

an input resistor coupled between the inversion input terminal of the operational amplifier and the reference voltage terminal of the reference voltage; and

a feedback resistor unit coupled between the inversion input terminal and the output terminal of the AGC amplifier; [[,]]

wherein the operational amplifier amplifies the input signals signal from the low pass filter on the basis of [[a]] the amplification gain defined decided upon by a resistance value of the input

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resistor and a resistance value of the feedback resistor unit.

8. (currently amended) The signal processor as set forth in claim 7, wherein the feedback resistor unit of the AGC amplifier comprises:

a resistor chain having a plurality of resistors coupled in series; and

a switching unit having a plurality of switches, each of the switches being coupled in parallel to [[each]] one of the resistors of the resistor chain in parallel, and being turned on/off in response to the gain control signal.

9. (new) A signal processor for use in an electronic compass for processing a signal from a geomagnetic compass sensor, said signal processor comprising:

a chopper for detecting the signal from the geomagnetic compass sensor;

an input amplifier having an input coupled to an output of said chopper for receiving the signal detected by said chopper and for amplifying the detected signal;

an offset controller having an output coupled to the input of said input amplifier for applying, in response to an offset control signal, a canceling voltage to the input of said input amplifier to cancel out an offset voltage generated during an amplifying process of said input amplifier;

a low pass filter having an input coupled to an output of said input amplifier for receiving the signal amplified by said input amplifier and for filtering the amplified signal;

an automatic gain control (AGC) amplifier having an input coupled to an output of said low pass filter for receiving the signal filtered by said low pass filter, setting an amplification gain in response to a gain control signal, and amplifying the filtered signal using the set amplification gain;

an analog/digital (AD) converter having an input coupled to an output of said AGC amplifier for receiving the signal which has been amplified by said ACG amplifier and which is analog, and converting the analog signal into a digital signal; and

a digital signal processor an input coupled to an output of said AD converter for receiving

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the digital signal, determining a maximum value and a minimum value associated with the digital signal, determining the offset voltage and an amplitude of the analog signal based on the maximum and minimum values, and, based on the determined offset voltage and amplitude, outputting the offset control signal to said offset controller so as to cancel the offset voltage and the gain control signal to said AGC amplifier so as to control the amplitude of the analog signal within an allowable input range of the AD converter.

10. (new) The signal processor as set forth in claim 9, wherein said digital signal processor is configured to determine the offset voltage based on an average value of the maximum value and the minimum value, and to determine the amplitude of the analog signal based on a difference value between the maximum value and the minimum value.

11. (new) The signal processor as set forth in claim 9, wherein said offset controller is configured to have a variable internal resistance value that varies with the offset control signal and wherein the canceling voltage is generated by said offset controller based on the variable internal resistance value.

12. (new) The signal processor as set forth in claim 9, wherein said offset controller comprises:

an operational amplifier having an inversion input terminal for receiving a base voltage, a non-inversion input terminal grounded through a resistor, and an output terminal coupled to a supply voltage;

a resistor chain having a plurality of resistors coupled in series between the output terminal and the non-inversion terminal of the operational amplifier; and

a switching unit having a plurality of switches each of which is coupled in parallel to one of the resistors of the resistor chain and is turned on or off in response to the offset control signal.

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13. (new) The signal processor as set forth in claim 9, wherein the AGC amplifier is configured to set the amplification gain based on a resistance value of said AGC amplifier and a variable resistance value varying with the gain control signal.

14. (new) The signal processor as set forth in claim 9, wherein the AGC amplifier comprises:

an operational amplifier having a non-inversion input terminal coupled to the output of said low pass filter for receiving the filtered signal, an inversion input terminal for receiving a reference voltage from a reference voltage terminal, and an output terminal;

an input resistor coupled between the inversion input terminal of the operational amplifier and the reference voltage terminal; and

a feedback resistor unit coupled between the inversion input terminal and the output terminal of the AGC amplifier;

wherein the amplification gain is defined by a resistance value of the input resistor and a variable resistance value of the feedback resistor unit, said variable resistance value varying with the gain control signal.

15. (new) The signal processor as set forth in claim 14, wherein the feedback resistor unit of the AGC amplifier comprises:

a resistor chain having a plurality of resistors coupled in series; and

a switching unit having a plurality of switches, each of which is coupled in parallel to one of the resistors of the resistor chain and is turned on or off in response to the gain control signal.

16. (new) A signal processor for use in an electronic compass for processing signals from a geomagnetic compass sensor detecting sine or cosine wave signals induced by a drive signal according to an azimuth angle, said processor comprising:

an analog signal processor for amplifying the signals from the geomagnetic compass sensor,

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canceling an offset voltage generated during an amplification process in response to an offset control signal, and controlling an amplitude of a signal in which the offset voltage is cancelled out in response to a gain control signal;

an analog/digital (AD) converter for converting analog signals from the analog signal processor into a digital signal; and

a digital signal processor for measuring a maximum value and a minimum value associated with the digital signal from the AD converter, determining the offset voltage and the amplitude based on the maximum and minimum values, and outputting, to the analog signal processor, the offset control signal to be used for canceling the determined offset voltage and the gain control signal to be used for controlling the determined amplitude so that the determined amplitude lies within an allowable input range for the AD converter;

wherein the digital signal processor:

measures the maximum value and the minimum value associated with the digital signal from the AD converter;

determines the offset voltage based on an average value of the maximum value and the minimum value;

determines the amplitude based on a difference value between the maximum value and the minimum value; and

outputs, to the analog signal processor, the offset control signal to be used for canceling the determined offset voltage and the gain control signal to be used for controlling the determined amplitude so that the amplitude lies within the allowable input range for the AD converter.